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SÉMINAIRE

Lundi 21 juin, 10h 30

*Salle de Conférence Bâtiment 15
Campus Boucicaut, 140 rue de Lourmel, 75015 Paris*

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PROBING EXTREME CONDITIONS USING ULTRAFAST HEATING WITH FREE ELECTRON LASERS

An important challenge in today condensed matter physics is the occurrence of polymorphism and the hypothesis about the existence of a coexistence line and a critical point separating low-density and high-density fluids in a class of substances which include water, C, Ge, Si and their oxides. The transition region often is located in a no man's land where crystallization of the liquid or of the glassy phase under extreme conditions prevents observation of the fluid transformation. Novel possibilities for studying matter under extreme conditions are opened by the forthcoming availability of free electron laser (FEL) facilities generating subpicosecond photon pulses of intensity in the VUV and Xray range, which are able to heat thin samples up to the warm dense matter (WDM) regime. Pump-and-probe ultrafast techniques can be used to study the dynamics of phase transitions and characterize the states under extreme and metastable conditions. In particular, thanks to the ultrafast bulk heating nature of the FEL pulses, pump and probe experiments can give access to what is presently a no man's land in simple liquids and glasses.

Here we report on preliminary results obtained in a pilot ultrafast experiment using a laser source as a probe and a supercontinuum probe aimed to characterize the melting process of Silicon. The extension to ultrafast measurements with a FEL source and the design of the TIMEX end-station to be installed at the Fermi@Elettra FEL facility will be discussed in details.

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